Hypertension

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Hypertension

Strokes 77%

Heart attacks 69%

Diabetes mellitus

Sudden cardiac death

Chronic kidney disease

Aortic Aneurysms

Atrial fibrillation

Dementia

Peripheral Arterial disease 60%

Heart Failure 74%

Health survey for England 2019

- Prevalence of hypertension 26% - 30%
- Untreated hypertension 11% - 14%
- Untreated hypertension highest among males 55 to 64 years 22%
- In women, highest among ≥65 years 19%

Case 1

- A 62-year old Ghanaian man with Chronic kidney disease eGFR 35%, BP of 178/109 mmHg, heart rate 62/min. He is on bendroflumethiazide 5mg od.
- What would you do to improve BP?

1. Change BFZ to Frusemide 20mg BD
2. Add Amlodipine 10mg od
3. Add Diltiazem LA 200mg od
4. Change BFZ to Atenolol 100mg od
5. Add Ramipril 10mg od

Case 2

- A 62-year old Ghanaian man with Chronic kidney disease eGFR 35%, BP of 178/109 mmHg, heart rate 62/min. He is on bendroflumethiazide 5mg od.
- Bloods: Plasma Na 142 mmol/L, plasma K 3.4 mmol/L.
- What is the likely explanation?

1. Bendroflumethiazide treatment
2. Drinking too much fluids
3. Hyperaldosteronism
4. Chronic kidney disease
5. Undiagnosed diabetes insipidus

Case 3

- A 61-year old female patient with multiple anti-hypertensive drug intolerances *(unable to tolerate amlodipine, nifedipine, felodipine, candesartan, irbesartan, bisoprolol, indapamide, bendroflumethiazide, doxazosin*)
- She was on Ramipril 10mg od but her BP was 151/92mmHg.
- Patient increased dose of Ramipril by herself to 10mg twice daily.
- BP is now 135/82mmHg
- GP is concerned about dose of ramipril.

Case 3

What would you do to this patient?

1. Reduce Ramipril and add Moxonidine
2. Change Ramipril to Atenolol
3. Change Ramipril to Diltiazem
4. Reduce Ramipril and add Losartan
5. None of the above

Medicines and Healthcare products Regulatory Agency (MHRA)

Prescribing in a patient's best interests

However, there are clinical situations when the use of unlicensed medicines or use of medicines outside the terms of the licence (ie, 'off-label') may be judged by the prescriber to be in the best interest of the patient on the basis of available evidence. Such practice is particularly common in certain areas of medicine: for instance, in paediatrics where difficulties in the development of age-appropriate formulations means that many medicines used in children are used off-label or are unlicensed.

Read more about medicines for children on the medicines for childrens section of the website

Healthcare professionals may regard it necessary to prescribe or advise on the use of an unlicensed medicine (eg through the so-called 'specials' regime when no licensed suitable alternative is available, or when a medicine is prepared in a pharmacy by, or under the supervision of, a pharmacist), or the use of a licensed medicine outside the terms defined by the licence (eg, outside defined indications, doses, routes of administration, or contrary to listed warnings).

GMC

105 Prescribing unlicensed medicines may be necessary in the following instances.

a. There is no suitably licensed medicine that will meet the patient's need. Examples include – but are not limited to – where:[34]

i. there is no licensed medicine applicable to the particular patient, for example, if the patient is a child and a medicine licensed only for adult patients would meet the needs of the child

ii. a medicine licensed to treat a condition or symptom in children would nonetheless not meet the specific assessed needs of the particular child, but a medicine licensed for the same condition or symptom in adults would do so

iii. the dosage specified for a licensed medicine would not meet the patient's need

iv. the patient needs a medicine in a formulation that is not specified in an applicable licence.

b. A suitably licensed medicine that would meet the patient's need is not available. This may arise where, for example, there is a temporary shortage in supply.

c. The prescribing forms part of a properly approved research project.

d. There is a serious risk to public health and the MHRA has temporarily authorised the sale or supply of an unlicensed medicine, such as a vaccine or treatment, in response.[35]

For amlodipine

BNF

Amlodipine is a dihydropyridine calcium-channel blocker.

Indications and dose

Angina,
Hypertension

By mouth

> **Adult**
> Initially 5 mg once daily; increased if necessary up to 10 mg once daily.

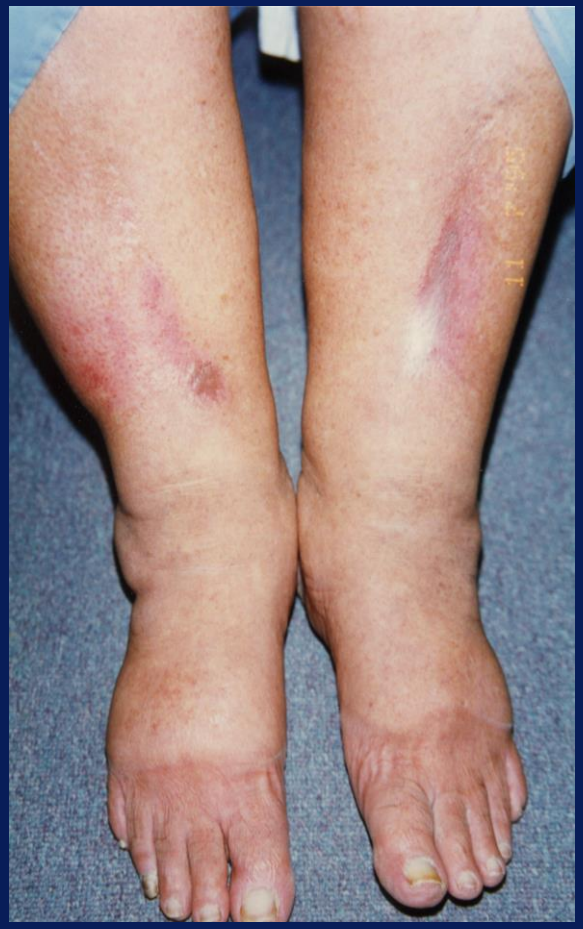
Dose equivalence and conversion

Tablets from various suppliers may contain different salts (e.g. amlodipine besilate, amlodipine maleate, and amlodipine mesilate) but the strength is expressed in terms of amlodipine (base); tablets containing different salts are considered interchangeable.

Calcium-Channel Blockers

Side effects:

- Ankle leg oedema
- Skin rash
- Gum swelling
- Headache
- Flushing



Case 4

1. Amlodipine 5 mg every other day should not be used because is not effective
2. Amlodipine 2.5 mg once daily can not be used because it is not effective
3. Amlodipine 20 mg od is contraindicated because it is dangerous
4. Amlodipine 2.5 mg once daily can not be used because it is dangerous
5. Amlodipine 10 mg twice daily is contraindicated because it is dangerous

Classification of Hypertension

Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Optimal blood pressure	<120	<80
Normal blood pressure	<130	<85
High-normal blood pressure	130-139	85-89
Hypertension = ≥ 140/90 mmHg		
Grade 1 Hypertension (mild)	140-159	90-99
Grade 2 Hypertension (moderate)	160-179	100-109
Grade 3 Hypertension (severe)	≥180	≥110
Isolated Systolic Hypertension (Grade 1)	140-159	<90
Isolated Systolic Hypertension (Grade 2)	≥160	<90

Definition of Hypertension

Office BP ≥ 140/90 mmHg

Home BP ≥ 135/85 mmHg

Daytime BP ≥ 135/85 mmHg

Nighttime BP ≥ 120/70 mmHg

White Coat Hypertension
(Isolated Office Hypertension)

- Elevation of BP due to stress or anxiety
- Clinic BP>140/90 + (HBP ≤ 135/85 or ABPM ≤130/80)
- Affects 15-30% of hypertensive patients
- CVD risk higher than in normotensives
- Requires lifestyle changes and close follow-up
- Drug treatment is required according to CVD risk
- White coat **Effect**

Masked Hypertension

- Normal office BP but high ABPM or home BP
- Clinic BP <140/90 + (HBP ≥135/85 or ABPM ≥130/80)
- Affects up to 33% of hypertensive patients
- Affects 10-15% of normotensive subjects
- Inappropriate TOD for office BP increase suspicion
- CVD risk is 2-3 times higher compared with normal BP
- Needs aggressive management

Causes of Hypertension

- Primary (Essential) hypertension
  - 80-90 %
- Secondary Hypertension
  - 10-20%
  - Endocrine *(Hyperaldosteronism, pheochromocytoma)*
  - Renal *(CKD, RAS, FMD)*
  - Drugs
  - Coarctation of aorta
  - Obstructive Sleep Apnoea

Importance of Secondary Hypertension

- Potentially curable
- Potentially fatal if not diagnosed and treated properly

When to Suspect Secondary HTN

- HTN in childhood
- Young patients (<40years)
- Severe hypertension (≥180/110)
- Resistant hypertension (≥3drugs+diuretic)
- HTN emergency (severe HTN+TOD)
- Abnormal biochemistry: low normal K or hypokalaemia, metabolic alkalosis, CKD, hypercalcaemia
- Suggestive symptoms: excessive sweating, palpitation, panic syndrome-like symptoms

Drug-Induced Hypertension

NSAIDs
Oral contraceptives
Alcohol, Cocaine
Cyclosporin, tarcolimus, erythropoietin
Glucocorticoids
Carbenoxolone, liquorice
Ginseng, yohimbin
Tyramine and MAO inhibitors
Angiogenesis inhibitors (avastin, lucentis,elyea)

Reminder of important clinical lesson

A salty cause of severe hypertension

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Summary

A 51-year-old lady was referred to our clinic because of severe hypertension; blood pressure 214/119 mm Hg despite treatment with an angiotensin receptor antagonist and a calcium channel blocker. Her initial laboratory results showed hypokalaemic alkalosis with normal urea and creatinine levels. Her 24-h urinary sodium excretion was markedly elevated at 244 mmol (equivalent to a daily intake of approximately 16 g of salt). Hyperaldosteronism was suspected but her plasma aldosterone level was subsequently found to be normal. On further questioning, the patient admitted to eating considerable amounts of salted liquorice and a diagnosis of acquired apparent mineralocorticoid excess was made. Liquorice has a well-known mineralocorticoid activity as it inhibits the action of 11-hydroxysteroid dehydrogenase 2 and can induce mineralocorticoid hypertension. After stopping eating the salted liquorice, the patient's blood pressure quickly normalised and all her antihypertensive medications were stopped.

BACKGROUND

This case describes unusual cause of severe hypertension and electrolyte abnormalities. The case highlights the importance of taking adequate dietary history, underscores the importance of suspecting and diagnosing potentially curable secondary hypertension and highlights the perilous interaction between high dietary salt intake and the ingestion of liquorice in inducing severe hypertension.

CASE PRESENTATION

In June 2004, a 51-year-old retired microbiologist was referred to us because of severe essential hypertension. She was treated with an angiotensin receptor antagonist (candesartan 16 mg once daily) and a calcium channel blocker (amlodipine 5 mg once daily) but her blood pressure (BP) remained very high at 214/119 mm Hg. Four years before her presentation her BP was normal and only after she had seriously dieted and lost almost half her body weight by losing eight stones that her BP started to increase. She was a non-smoker and drank three to four units of alcohol per month. When the patient was first seen in our unit she underwent 24 h ambulatory blood pressure monitoring which confirmed that her blood pressure was not adequately controlled as it revealed a mean day time blood pressure of 141/90 mm Hg, and a mean night time blood pressure of 140/85 mm Hg. Her initial laboratory results showed that her plasma sodium was 139 mmol/l, plasma potassium was 3.1 mmol/l and her bicarbonate was 33 mmol/l, with normal urea and creatinine levels. Her 24-h urinary sodium excretion was markedly elevated at 244 mmol (equivalent to a daily intake of approximately 16 g of sodium chloride) and potassium excretion was 141 mmol. We suspected hyperaldosteronism because of the hypokalaemic alkalosis and hypertension. After correcting her hypokalaemia with oral potassium supplements, we checked her plasma renin activity (PRA) and plasma aldosterone levels, both of which were found to be within normal limits; plasma aldosterone was 113 pmol/l (100–600) and PRA was 1.28 ng/ml/h (0.6–4.5). We suspected apparent mineralocorticoid excess (AME) and on further questioning, the patient admitted to her extreme fondness for eating salted liquorice. Since she was a young schoolchild she has eaten liquorice on a regular basis. However, when her husband started travelling to Norway on a weekly basis in 1999 she discovered 'the delights of Salty and Salmiak flavoured Norwegian liqorice' (unavailable at the time in UK but widely available in continental European countries) and her consumption level rocketed. In fact, in the months prior to her presentation she had approximately 750–800 g of salted liquorice per day. The patient was not a very keen cook and she relied heavily on ready-made meals which have a high salt content.

The diagnosis was then established as acquired AME secondary to liquorice ingestion. We advised the patient to stop eating liquorice, to cut down on her salt intake and to eat more fruits and vegetables. The patient initially found it difficult to comply with this advice but on our persistent recommendation she eventually stopped and also reduced her salt intake. The patient's BP quickly improved with the discontinuation of liquorice ingestion and all her antihypertensive medications were stopped. When the patient was reviewed in our clinic 6 months later, her 24 h sodium excretion was reduced to 87 mmol and her BP remained normal at 124/82 mm Hg while on no treatment with normalisation of her plasma potassium and bicarbonate levels.

This case emphasises the importance of taking adequate dietary history, underscores the importance of suspecting and diagnosing potentially curable secondary hypertension, and highlights the perilous interaction between high dietary salt intake and the ingestion of liquorice in inducing severe and difficult to treat hypertension. The finding of hypertension and hypokalaemia, whether

Threshold for Drug Treatment

- Sustained SBP ≥ 160 or DBP ≥ 100 mmHg

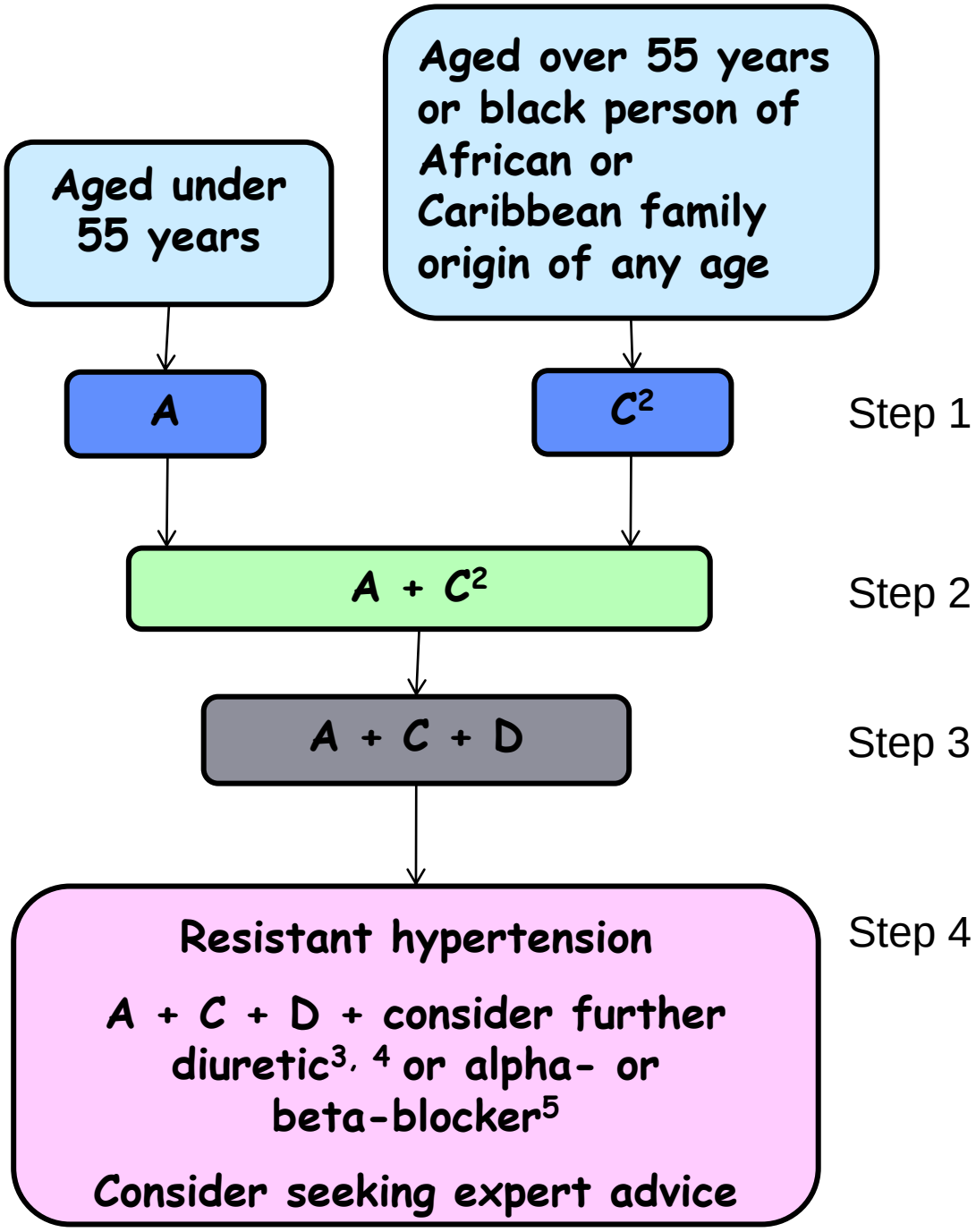
- Sustained SBP 140-159 or DBP 90-99

  AND Target organ damage
  Cardiovascular disease
  Diabetes mellitus
  CVD risk ≥ 20%

Summary of antihypertensive drug treatment

BHS British Hypertension Society

NHS National Institute for Health and Clinical Excellence



Key

A – ACE inhibitor or angiotensin II receptor blocker (ARB)[1]

C – Calcium-channel blocker (CCB)

D – Thiazide-like diuretic

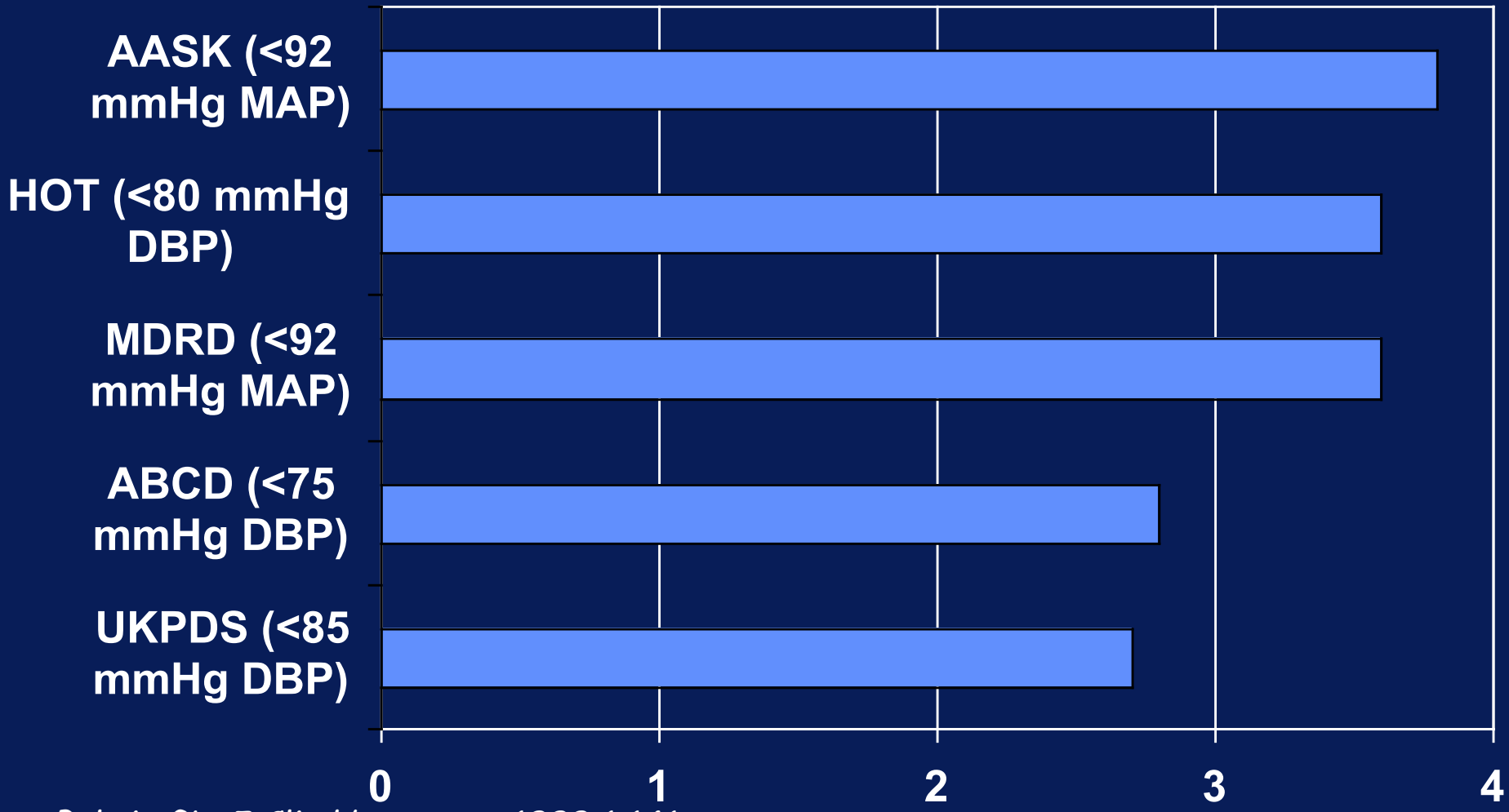
Drugs for HTN

- Calcium channel blockers (CCB)
- Angiotensin converting enzyme inhibitors (ACEi)
- Angiotensin receptor blockers (ARB)
- Diuretics
- Alpha blockers
- Beta blockers
- Mineralocorticoid receptor blockers
- Direct renin inhibitors
- Centrally acting drugs
- Direct vasodilators

Indications and contraindications for antihypertensive drugs

Class of Drug	Compelling indications	Possible Indications	Possible Contraindications	Compelling Contrindications
a-Blockers	BPH	Dyslipidaemia	Postural Hypotension	Urinary Incontinence
b-Blockers	MI Angina	HF*	HF*, PVD, Dyslipidaemia	Asthma, COPD, Heart block
ACE-I	HF, LV dysfunction, IDDM, Nephropathy	Renal disease, NIDDM, Nephropathy	Renal impairment PVD	Pregnancy, Renovascular hypertension
AIIA	ACEi cough*	HF	PVD	Pregnancy, Renovascular hypertension
CCB dihydropyridines	Elderly ISH	Elderly Angina		
CCD rate-limiting	Angina	MI	With BB	Heart block Heart failure
Thiazides	Elderly		Dyslipidaemia	Gout

Average number of BP drugs needed per patient to achieve target BP goals



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